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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/674,925	11/08/2000	Jyoti Kiron Bhardwaj	WLJ.067	7580
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VOLENTINE FRANCOS, & WHITT PLLC ONE FREEDOM SQUARE 11951 FREEDOM DRIVE SUITE 1260 RESTON, VA 20190				
			EXAMINER AHMED, SHAMIM	
			ART UNIT 1765	PAPER NUMBER

DATE MAILED: 05/18/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/674,925

Applicant(s)

BHARDWAJ ET AL.

Examiner

Shamim Ahmed

Art Unit

1765

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 03 March 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1,2,4-35 and 38 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 31 and 32 is/are allowed.
- 6) ☒ Claim(s) 1,2,4-30,33-35 and 38 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

**DETAILED ACTION**

***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 3/3/06 has been entered.

***Response to Arguments***

2. Applicant's arguments filed 3/3/06 have been fully considered but they are not persuasive. Applicants argue that Beaudry does not teach utilizing a measurement of impedance mismatch in order to compensate for the impedance mismatch by adjusting a process parameter to stabilize the plasma.

In response to the argument, examiner states that the argument is not persuasive because Beaudry teaches an automatic impedance matching network, which is directly relating the changes in the process parameter (col.5, lines 11-22).

Beaudry also teaches that impedance will change with the changes in the process parameters such as gas flow rate and pressure (col.3, lines 13-16).

It is also noted that any impedance matching network measure the mismatch impedance during a process between the generator and the plasma results in loss of power and efficiency and an impedance converter compensate or varies process parameters to provide impedance matching (see col. 1, lines 34-45).

Therefore, Beaudry teaches the measurement of impedance mismatch to compensate the impedance mismatch by adjusting process parameter between the plasma generator (plasma power) and the plasma as claimed.

***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 1-2,4-10,13-18, 33-35 and 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawasaki et al (4,795,529) in view of Beaudry (3,569,777).

Kawasaki et al disclose an apparatus and a process, wherein etching step and deposition step can be carried out alternately.

Kawasaki et al also teach that the two alternating steps have different processing parameters such as the voltage is different in the two alternating steps (col.1, lines 66-68, col.2, lines 1-2, and lines 12-17).

Kawasaki et al, further disclose that the plasma generation for the two steps are stabilized by a matching box, that consists of capacitor (col.3, lines 53-65 and col.16, lines 19-21).

Kawasaki et al remain silent about the step of compensating for a mismatch between the impedance of power supply and the impedance of plasma to stabilize the plasma.

However, in a method of plasma generation, Beaudry teaches that an impedance matching network for plasma generating apparatus, which will automatically provide without any required manual adjustment, wherein an impedance mismatch is detected between the generator (power source) and the plasma (col.1, lines 60-68).

Beaudry also teaches that the mismatch can be compensated by an impedance converter by changing the operating parameters (col.1, lines 34-45).

Therefore, it would have been obvious to one skilled in the art at the time of claimed invention to combine Beaudry's teaching into Kawasaki et al's process for easily generating a stable plasma as taught by Beaudry.

As to claim 4, Kawasaki et al teach that the RF power is inductively coupled into the plasma (see figure 1).

As to claims 6-7, Kawasaki et al teach that the matching box is controlled by electrically such as a controller (col. 7, lines 6-20, col.15, lines 28-32).

As to claims 14-15, Kawasaki inherently teach that the capacitors are adjusted to different values for each of the steps because the matching box or matching unit is adapted to control the RF power source.

As to claims 17 and 18, Kawasaki teaches that the positions of the capacitor do not vary between etch and deposition step (figure 16).

As to claim 38, Beaudry teaches that changes in process parameter such as pressure affect the impedance of plasma, which could be compensated between the power and the plasma to provide impedance matching (col.1, lines 34-45).

As a result of the impedance matching, it would have been obvious that the process parameter such as pressure could be unchanged.

6. Claims 1-2,4-5, 19-25,29-30 and 33-35 rejected under 35 U.S.C. 103(a) as being unpatentable over Okudaira et al (4,985,114) in view of Beaudry (3,569,777).

Okudaira et al disclose a process, wherein etching and deposition is performed alternately into a reaction chamber at predetermined time intervals.

Okudaira et al also disclose that at least etching gas and the deposition gas are supplied alternately and for a certain period of time etching gas and deposition gas can be supplied simultaneously and continuously (col.2, lines 41-49 and figures 1 and 3).

Okudaira et al, further disclose that the intensity of the power is controlled by an impedance matching circuit for compensating the high frequency power supply (col.5, lines 15-17).

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Okudaira et al remain silent about the step of compensating for a mismatch between the impedance of power supply and the impedance of plasma to stabilize the plasma.

However, in a method of plasma generation, Beaudry teaches that an impedance matching network for plasma generating apparatus, which will automatically provide without any required manual adjustment, wherein an impedance mismatch is detected between the generator (power source) and the plasma (col.1, lines 60-68).

Harvey also teaches that the mismatch can be compensated by an impedance converter by changing or varying the operating parameters (col.1, lines 34-45).

Therefore, it would have been obvious to one skilled in the art at the time of claimed invention to combine Beaudry's teaching into Okudira et al's process for easily generating a stable plasma as taught by Beaudry.

As to claim 19, Okudaira et al teach that the plasma is stabilized by maintaining a reduced pressure of the alternating etching and depositing gas (col.5, lines 38-42).

As to claim 20, Okudaira et al teach that deposition gas is supplied before the etching gas is switched off or vise- versa (see figure 3).

As to claims 29 and 30, Okudaira et al teach that the pressure is monitored and adjusting the flow of the process gases into the chamber during the alternating etch and deposition steps (col.5, lines 38-42).

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7. Claims 11-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawasaki et al (4,795,529) in view of Beaudry (3,569,777) as applied to claims 1-2,4-10,13-18,33-35 and 38 above, and further in view of Sadinsky (5,424,691).

Kawasaki discloses above in paragraph 5 but fails to disclose that a motor, which is driven by control signals, drives the matching unit.

However, Sadinsky discloses a method, wherein RF power is adapted through an impedance matching net work, that comprises capacitors and are driven by motor for proper adjustment and further more the motor is driven by a signal generator (col.3, lines 28-34 and lines 60-col.4, lines 5).

Therefore, it would have been obvious to one skilled in the art at the time of claimed invention to employ Sadinsky's teaching into modified Kawasaki et al's method for proper adjustment of the capacitors in the matching unit as taught by Sadinsky.

8. Claims 26-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawasaki et al (4,795,529) in view of Beaudry (3,569,777) as applied to claims 1-2,4-10,13-18, 33-35 and 38 above, and further in view of Leiphart (5882,488).

Kawasaki discloses above in paragraph 5 but fails to disclose that a further gas can be introduced into the chamber to stabilize the plasma.

However, Leiphart teaches that the introduction of an inert gas such as argon or any noble gas can be used into the chamber to stabilize the plasma (col.10, lines 66-col.11, lines 4).



Therefore, it would have been obvious to one skilled in the art at the time of claimed invention to employ Leiphart's teaching into modified kawasaki's method for stabilizing the plasma as taught by Leiphart.

***Allowable Subject Matter***

1. Claims 31-32 are allowable over prior art.
2. The following is a statement of reasons for the indication of allowable subject matter: The prior art does not teach providing a chamber in which a portion is separated from a main part of the chamber by a deflectable member and also does not teach that the volume of the separated portion is larger than the main part as the context of claims 31 and 32.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shamim Ahmed whose telephone number is (571) 272-1457. The examiner can normally be reached on M-Thu (7:00-5:30) Every Friday Off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine G. Norton can be reached on (571) 272-1465. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Shamim Ahmed  
Primary Examiner  
Art Unit 1765

SA  
May 13, 2006